NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety

WRECKAGE EXAMINATION SUMMARY

November 10-12, 2020

A. ACCIDENT ERA21LA003

Location:	Corfu, New York
Date:	October 2, 2020
Time:	1144 Eastern Daylight Time (EDT)
Operator:	Private
Aircraft:	Socata TBM 750
Registration:	N965DM

B. PARTICIPANTS:

IIC: Heidi Kemner
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Airworthiness GC: Tom Jacky
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Participant: Les Doud
Hartzell Propeller
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Participant: Jeff Davis
Pratt & Whitney Canada
Bridgeport, West Virginia

Participant: Phillippe Santoro
Daher Aircraft
Pompano Beach, Florida

C. SUMMARY

On October 2, 2020, at 1144 eastern daylight time, a Socata TBM 700, N965DM, was destroyed when it was involved in an accident near Corfu, New York. The private pilot and passenger were fatally injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 personal flight.

D. DETAILS OF THE INVESTIGATION

1.0 Airframe Examination

The airplane was manufactured in 2009 and its most recent annual inspection was December 6, 2019. The wreckage was located in a 15 ft deep crater.

Figure 1. Overview of wreckage layout.

1.1 Fuselage

The fuselage was fragmented by impact forces. Both VHF antennas were located with the wreckage. One remained attached to the fuselage and the other was impact separated.

A section of the main cabin door was located in the wreckage. The door locking pins were extended. No damage was noted to the locking hooks and the door handle was in the closed position.

1.2 Empennage

The empennage was fragmented.

The left elevator horn was impact separated from the elevator. The left elevator trim tab was separated from the left elevator and located in 4 sections. The left side of the horizontal stabilizer was impact separated. About 80% of the left elevator was located in the wreckage.

The inboard section of the right elevator trim remained attached to the elevator. A 1.5 ft section of the right elevator trim tab was impact separated. The inboard section of the right elevator was attached to the horizontal stabilizer. The right outboard elevator horn and a 2 ft section of the right elevator was impact separated. The bicycle chain for the right elevator trim remained attached to the horizontal stabilizer. The elevator trim actuators were both located and measured 16mm, which corresponded to about the neutral position. The right elevator horn was impact separated and located.

The rudder was impact separated from the vertical stabilizer. The right side of the vertical stabilizer was impact separated from the empennage but remained intact. The lower section of the rudder trim remained attached to the rudder. The forward spar of the vertical stabilizer was located. The deicing boot of the vertical stabilizer was located. The top section of the rudder and rudder trim tab were not located. The tailcone was impact separated and located in the wreckage.

1.3 Wings

The wings were fragmented. Multiple sections of cap spars were impact separated from the spar and located with the wreckage. The center section of the wing spar was impact damaged. Both the forward and aft section of the center wing spar was bent symmetrically about 43° from the original position.

Figure 2. View of forward and aft sections of center wing spar.

The left-wing tip was impact separated and the aft section was located with the wreckage. The radar pod on the left wing was impact separated and exhibited compression damage. The left flap actuator indicated the flaps were in the retracted position. The left spoileron was impact separated into several sections. The left aileron was impact separated and a bottom section was located. The left flap was impact separated and about 12 ft of about 16 ft of flap was located in 3 pieces. All 3 left flap tracks were impact separated and located. The left spoileron mechanism was impact separated and located. The outboard section of the left wing was fire damaged. However, no soot tailing was noted.

Figure 3. View of left wing.

The right-wing tip was impact separated and the aft section located with the wreckage. A majority of the right spoileron was located separated from the right wing. The right aileron was impact separated and located. The right flap was impact separated and about 3 ft of the inboard section of the flap was located. Two of the 3 right flap tracks were located in the wreckage. The right flap rooftop was separated into several pieces.

Figure 4. View of right wing.

Several sections of flap and wing were located, but the position of the pieces could not be determined.

1.4 Landing Gear

The left and right main landing gear were impact separated. The left landing gear tire was impact separated. The landing gear actuators were found in the gear up position. The nose landing gear was impact separated. Both main landing gear compass linkages were compressed and parallel with the landing gear strut.

1.5 Cockpit

A section of one yoke was located among the wreckage. A section of the right yoke was located. The compass was impact separated and damaged.

1.6 Flight Controls

Control cable continuity was unable to be determined due to the fragmentation of the fuselage. However, all sections of the cables and push-pull tubes located exhibited tensile overload fractures. The flight control interconnect mechanism in the cockpit was located.

The autopilot aileron and trip servos were located, and all cables exhibited tensile overload failures.

1.7 Survivability

The two front seats of the airplane were equipped with 4-point restraint systems. Both 4-point restraint systems were located. One 4-point restraint exhibited deformation and all points remained attached to the buckle. The other 4-point restraint system did not exhibit deformation and one male end of the belt was not clasped in the buckle but was located among the wreckage.

Two inertial reels were located with the spring on the exterior of the reel.

A partial aft facing passenger seat was located in the wreckage and a partial forward facing passenger seat was found.

A passenger emergency oxygen mask was located separated from the airframe, but the mask remained inside the housing.

1.8 Weight & Balance

Weight and balance calculations were performed using weight and balance documents from the maintenance records, the approximate weights of the occupants, and approximate baggage recovered at the scene. Calculations revealed the airplane weighed about 6,387.6 pounds at takeoff. The manufacturer's maximum allowable gross weight was 7,430 pounds.

Item	Weight
Airplane Basic Empty Weight	4587.79 lbs
Pilot	165 lbs
Passenger	120 lbs
Fuel	217 US Gallons = 1,475.6 lbs
Baggage	40 lbs
Total	6,387.6 lbs

1.9 Fuel/Fuel System

All fuel tanks were breeched.

2.0 Engine Examination

Pratt & Whitney Canada, PT6A-66D
850 shaft horsepower
Engine Total Time – 1181.8
Most recent inspection – December 6, 2019

The engine was viewed in a plastic recovery bag. The engine was removed from the bag placed on the floor in the inverted position. The accessory gearbox and inlet case were missing. Two 1st stage compressor blades were attached to the rotor, the remaining blades were all fractured. The gas generator case was bent, compressed, and distorted. The exhaust duct was compressed closing off both of the port openings and was split on the bottom between the exhaust ports adjacent to the flange. The majority of the front reduction gearbox housing was missing. The propeller shaft was in place and

attached to the 2nd stage carrier, the shaft was deflected towards the 5 o'clock position at an approximate 45° angle.

2.1 Power Control Linkage and Reversing Linkage

The control and reversing linkage was missing except a section of the wire rope and casing that was attached to the center fireseal.

2.2 Pneumatic Lines

The P3 line and P3 filter were impact separated from the engine. The section of tube that connects the gas generator case boss to the filter housing was impact separated. The filter housing was impact separated from the engine. The section of tube that connects the filter housing to the fuel control was impact separated from the engine but was attached to the fuel control fitting. The tube end connected to the fuel control fitting was secured with lock wire and was tight. The filter was removed and was contaminated with water and mud from the accident site.

The power turbine control line was missing.

2.3 Chip Detectors and Filters

The chip detector was not located. The oil filter remained in the filter housing and the exposed section was coated with soil.

2.4 Compressor Turbine Section

The gas generator case was sectioned adjacent to the exhaust duct mating flange (C flange) and between the fuel nozzle bosses and the engine mounts. The majority of the section pieces were mechanically separated from the engine and the power section was mechanically separated from the gas generator section. The power turbine housing was retained in the gas generator case by the bent combustion chamber liners. Portions of the 1st and 2nd stage power turbine vanes were retained in the power turbine housing. Fractured sections of the compressor turbine blades, 1st and 2nd stage power turbine blades, vane airfoils, and the inner rims of the vanes were lying in the gas path, surrounded by mud.

The downstream side compressor turbine disc exhibited circumferential scoring across the entire face from contact with the 1st stage power turbine vane, disc, and shaft. The disc balancing rim and tooling lugs were machined off. The blades were impact separated from the disc except portions of several blade firtrees.

The compressor turbine shroud was rubbed and battered. The compressor turbine vane was fragmented.

2.5 Combustion Section

The accessed portions of the combustion chamber liners were bent and distorted. The small exit duct was not accessed for the purpose of this investigation.

2.6 Power Turbine Section

The 1st stage vane baffle exhibited rub marks on the upstream face from contact with the downstream side of the compressor turbine. The baffle was adhered to the upstream face of the 1st stage power turbine disc. The center baffle was machined and torn through due to rotational contact between the compressor turbine disc and 1st stage power turbine disc. The 1st stage power turbine vane was fragmented but the outer rim was contained in the power turbine housing. The 2nd stage

power turbine vane was fragmented but the outer rim region was contained in the power turbine housing.

The upstream face of the 1st stage disc exhibited circumferential scoring from contact with the downstream side of the 1st stage power turbine vane baffle. Thirteen blades were fractured above the blade platform and were partially displaced forward in the disc. The remaining blades were impact separated from the disc. The fracture surfaces that were not smeared exhibited features consistent with overload. All of the 2nd stage power turbine blades were fractured. The fracture surfaces that were not smeared exhibited features consistent with overload. The washer mating face of the 1st stage power turbine disc were machined off and were missing.

2.7 Compressor Section

The leading edge of the two of the 1st stage compressor blades exhibited impact damage and were bent opposite the direction of rotation. The remaining blades were fractured at the blade root. An inlet case fragment was situated between the two 1st stage blades and the 1st stage compressor shroud. One fractured blade was also pinched between the inlet fragment and the rotor. The fracture surface exhibited features consistent with overload. The first stage compressor stator airfoils were all bent in the direction of rotation. The visible 2nd stage compressor blades were bent opposite the direction of rotation. The compressor was not removed for the purpose of this investigation.

2.8 Reduction Gearbox (RGB)

The majority of the front reduction gearbox housing was missing except portions of the flange. The propeller shaft was attached to the propeller flange (Ref. Photo No. 12). The 2nd stage ring gear was attached to the engine and exhibited some impact damaged teeth. The carrier, No. 5 bearing and the propeller shaft sleeve were in place. The No 6 bearing inner race was in place and it was fractured. The No. 6 bearing outer race was impact fractured and separated from the engine. The gearboxes were not disassembled for the purpose of this investigation.

2.9 Accessory Gearbox (AGB)

The housing and diaphragm were missing. Four spur gears were recovered and three of them exhibited impact bending. The pressure and scavenge pumps were impact separated and contained their respective gears.

2.10 Controls and Accessories

The ignition box was missing. A fragment of one lead was attached to the gas generator case. Both ignition plugs were fractured.

The fuel control housing was impact fractured adjacent to fuel pump mounting flange. The housing exhibited numerous impact damage regions.

The fuel pump was impact separated from the accessory gearbox and exhibited external impact damage.

The fuel to oil heat exchanger was impact separated from the engine and was battered and fragmented.

The flow divider was impact separated from its respective mounting nozzle and was retained to the engine by the fuel line.

All of the fuel nozzles except the bottom nozzle were in place. Most of the nozzle sheathes were bent or fractured.

The compressor bleed valve was in place on the gas generator case but was battered. The valve was not removed for the purpose of this investigation.

The torque limiter, propeller governor, and the overspeed governor were missing.

3.0 Propeller Examination

Hartzell HC-E5N-3C/NC8834K, S/N – RJ234, 5-blades
Annual Inspection - 12/6/19
Constant speed, full feathering, reversing propeller

The propeller hub was impact separated from the engine. All 5 blades were impact separated from the hub. A portion of each of the 5 blades was located in the vicinity of the wreckage.

Figure 5. Propeller blades.